

## Tropical GRIP Forecast Discussion for August 30, 2010

Created 1600 UTC August 30, 2010

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### **Summary:**

The DC-8 is flying back into Hurricane Earl today to further investigate possible rapid intensification occurring. The WB-57 is ferrying to Tampa with the plan of flying into Earl on Tuesday, Wednesday and Thursday, and the Global Hawk has plans to take off Wednesday and fly over the storm on Thursday. The various aircraft are trying to fly either coincident or consecutively with other NOAA and Air Force reconnaissance aircraft to obtain a nearly continuous set of observations in the system. Earl is intensifying and is expected to continue to do so as it moves WNW and gradually turns NW over the next few days, staying East of the Bahamas and riding up the eastern coast of the US. Behind Earl, AL97 is forecast to become a TD shortly, and some models, such as the HWRF, GFDL, and ECMWF, continue to develop it into possibly TS Fiona over the next few days. This system will head more west than Earl, but could possibly continue to make a similar track recurvature to Earl. Danielle is still a hurricane for now but is clearly beginning to lose its tropical characteristics as it is moving further north, and it is forecast to continue to weaken. PGI-38L is embedded in a tropical wave that emerged from Africa a short time ago, and there is no development forecast for its near future.

### **Forecast for 1600 UTC 8/30/2010:**

### **Synoptic Overview:**

The surface analysis (**S1**) shows two major high pressure systems affecting the Atlantic Ocean. The first is centered over the Middle Atlantic States with a central pressure of 1026 hPa. The second is centered over the central Atlantic, with a central pressure of 1022 hPa. This value is ~ 4 hPa stronger than yesterday. Danielle is located between the two highs. The tropics are a region of relatively low pressure that contains Hurricane Earl as well as PGI36L and PGI38L.

The CIMSS upper level winds and water vapor imagery (**C1**) contains relatively few entries this morning. However, anticyclonic flow continues over the Gulf of Mexico. Troughs are located just off the East Coast and continuity suggests a second trough over the eastern Atlantic. Outflow from Earl has increased dramatically since yesterday. Although outflow is apparent in all quadrants, it seems strongest in the southern half of the storm. Some upper level outflow seems to be developing in association with PGI36L.

**S3** shows a better view of Earl and the two PGIs. **S7** shows that these three systems are embedded in a well defined 700 hPa wave train that exits Africa and moves westward. This westward motion is aided by the tropical easterly jet (red dotted line) that is oriented almost perfectly east to west.

With the exception of Danielle, much of the middle latitude North Atlantic is dry in the middle and upper layers and upper troposphere (**S4**). This feature is more pronounced today than in recent days. The decaying middle latitude cyclone has

transported drier air from the north, and there has been subsidence associated with the surface anticyclone over the East Coast. Dry outflow from Africa continues, and all of the Gulf of Mexico and most of Caribbean continue to be very humid. Earl, PGI36L, and PGI38L are all in these regions of humid air. The figure shows that drier air is encircling the storms to varying extents. This is discussed in greater detail below. The GEOS-5 aerosol products show that most of the tropics have heavy aerosol loading from Africa (**38D**), including the areas of greatest TPW. Earl, PGI36L and PGI38L are also embedded in this aerosol region (**S5**).

### **Features of Interest:**

#### **Hurricane Danielle:**

As of 30/0900Z, Danielle is still a hurricane, located at 40.4N/52W (**S1**), with an intensity of 65 kts. SSTs in this area are near 25 C and vertical wind shear is fairly strong. This is due to the baroclinic trough that has been interacting with Danielle. Satellite imagery shows that the southeastern side of the storm is now exposed with very dry air wrapping into this quadrant (**D1**). The NHC official track forecast calls for continued NE motion through Thursday before turning NW toward Greenland (**D2**). So, the storm is clearly losing tropical characteristics, and will likely be classified as extra-tropical either tonight or tomorrow. While Danielle had an interesting life cycle, it never came within range of the GRIP aircraft.

#### **Hurricane Earl:**

As of 11AM EDT Earl is located at 18.7N/63.6W moving WNW at 13 kts (**S1**). Winds are sustained at 105 kts making this a category 3 storm on the Saffir-Simpson scale, and it is only intensifying more with time. The structure of Earl is such that an eye is very clear in the visible imagery (**E2**). Strong easterly outflow is creating a heavily electrified band of precipitation picked up by the San Juan radar (**E3**). In fact, the storm has observed lightning in all four quadrants and around the eye (**S6**). Shear from Danielle appears to be slightly suppressing the convection on the east side of Earl. At 1200 UTC the shear on the east side of Earl was on the order of 20 kts. At 1200 UTC, IR shows the coldest cloud tops are covering the western half of Earl (**E1**), but 85 GHz brightness temperatures reveal that convective towers or “bursts” exist only near the cyclone center and in the rain band over Puerto Rico. Water vapor imagery suggests that dry air wrapped around and circulated about Earl’s center early this morning, but the most recent (1700 UTC) satellite imagery now shows that Earl has gained symmetry.

The model track consensus curves Earl to the North of Puerto Rico over the next 24 hours (**E4**). Earl is expected to skirt the western edge of the Atlantic subtropical high. Track guidance is still suggesting that Earl could possibly affect the United States’ east coast over the next 3-5 days (**E4**). Intensity forecast (**E5**): Oceanic conditions remain favorable for Earl’s intensification. The depth of the 26 C degree isotherm remains at 100m and Earl is positioned in an area of 30 C SSTs. Earl has been intensifying on the order of 2 hPa hr<sup>-1</sup> since yesterday and has a current central pressure of 960 hPa. Intensity guidance

spread ranges from development into a moderate CAT3 to a moderate CAT4 over the next 24 hr (**E5**).

#### **AL97/PGI-36L:**

The surface low pressure associated with AL97 is located near 14N/45W (**S1, S4, S7**). Visible satellite imagery of this system indicates AL97 is showing better signs of organization as the satellite loop reveals a broad circulation associated with the system (**F1**). Convective activity with AL97 remains somewhat limited, although thunderstorms have increased over the past 12 hours. Most of the convective activity and coldest cloud tops are concentrated on the west side of the system (**F1**). The invest is currently located in a region with SSTs warmer than 28°C, and the environmental wind shear over the invest is less than 10 knots. So, at this point, conditions appear favorable for TC development within the next 24 hours.

Track guidance takes this system to the WNW for the next few days before curving northward by days 4-5 (**F3**). SSTs ahead of the system are very warm (approaching 30°C); however, one limiting factor could be the increased vertical wind shear along the forecast track of AL97. The strong upper-level outflow associated with Hurricane Earl may limit the development of this system as it continues moving WNW across the Atlantic. Additionally, CIMSS analysis reveals some dry mid-level air beginning to wrap around the west side of AL97 (**S4**). In terms of intensity, model guidance suggests AL97 will strengthen into a tropical storm over the next 36 - 48 hours while conditions are still favorable (**F4**). Beyond this, significant strengthening seems unlikely due to increased environmental wind shear along the forecast track. The ECMWF continues to more aggressively develop AL97, and in five days the model places the TC around 24N/70W (**F2**). The latest run of the GFS, on the other hand, never really develops this system at all (**F2**). At this point, it looks like slow development of AL97 is possible over the next couple days. However, the hurricane potential of this system appears low.

#### **PGI-38L:**

Convection and relatively vorticity associated with PGI-38L remain disorganized (**38A, 38B**) and weak but with a stronger vorticity of 30 s<sup>-1</sup> located farther north. The wave is primarily a south-track wave with its convection having been triggered by monsoonal flow over Africa and persisted out into the Atlantic with low level winds and moisture to support the convection. There is currently no closed anticyclonic circulation at upper levels associated with PGI-38L. Global models predict that PGI-38L will continue to move westward over warm SSTs and enter a moderate vertical wind shear region in the next 48 hrs (**38C**). Afterward, the models still do not predict that it will gain strength.

#### **Dust/SAL Discussion:**

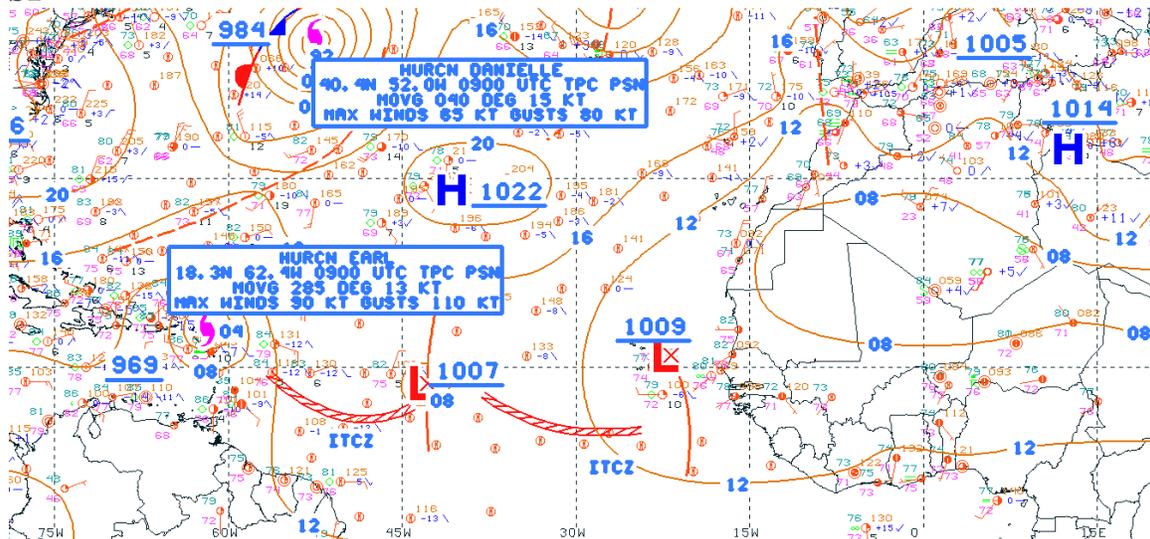
As of 1400 UTC on Monday August 30, there were two interesting dust features in the tropical Atlantic. The first is an emerging SAL event which was excited by MCS activity in east Africa associated with PGI-38L. MODIS AOT from the Aqua spacecraft shows extreme dust loading currently over the Cape Verde islands (**S5**). Optical thicknesses are well above 1.0 in a wide swath extending from 30W/12N northwest to

20W/20N (See MODIS AOT 24 hour composite centered at 1743 UTC on 8/29 from NRL, **S5**). This swath is simply a local maximum within the primary SAL area that has been present for more than two weeks. An active SAL along with ridging and stable descending upper level air in the northeast Atlantic has kept dust loading high in a large region. This region is bordered by 45W on the west and extends meridionally between 10N and 30N. The most recent SAL outbreak will continue to feed the higher-than-climatology AOTs found in this region. The GEOS-5 dust module suggests that dust loading is highest in the layer between 700 and 500 hPa as the SAL exits the African coast (**38D**).

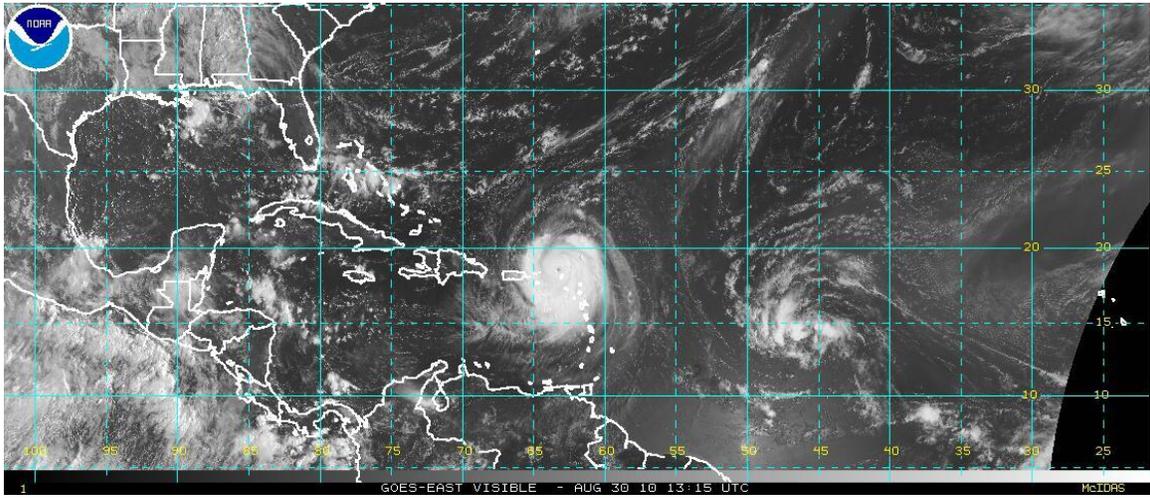
The second feature is the dusty air which has wrapped hurricane Earl. This dust along with dry air has been present in the near storm environment since genesis of TD07 on 8/25. MODIS aerosol optical thickness suggested that high dust loading was still present near the storm on its northwest side as of 1630 UTC on 8/28. However, on 8/29 as Earl strengthened and became a mature hurricane, a strong rainband likely removed most of the dust in this sector. MODIS imagery from 1730 UTC yesterday suggests that there is little dust left, except some on the southwest side of the storm (See MODIS AOT 24 hour composite centered at 1743 UTC on 8/29 from NRL, **S5**). AIRS soundings as of 0530 UTC today suggest that there is still a ring of fairly dry air surrounding EARL. The northwest side of the storm is the driest at mid and upper levels. There is also dry air further east between Earl and the developing system AL97L.

## Images used in discussion:

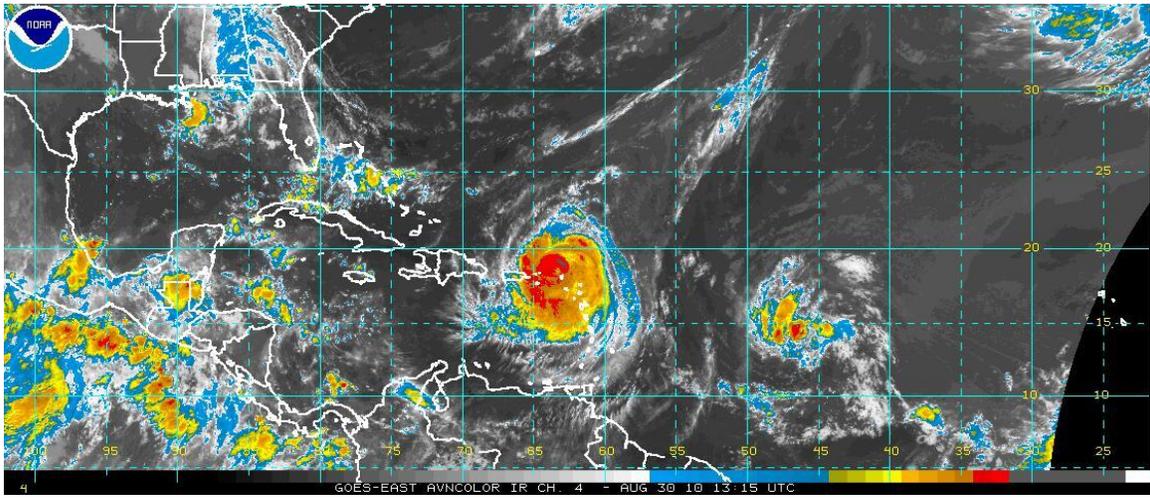
S1



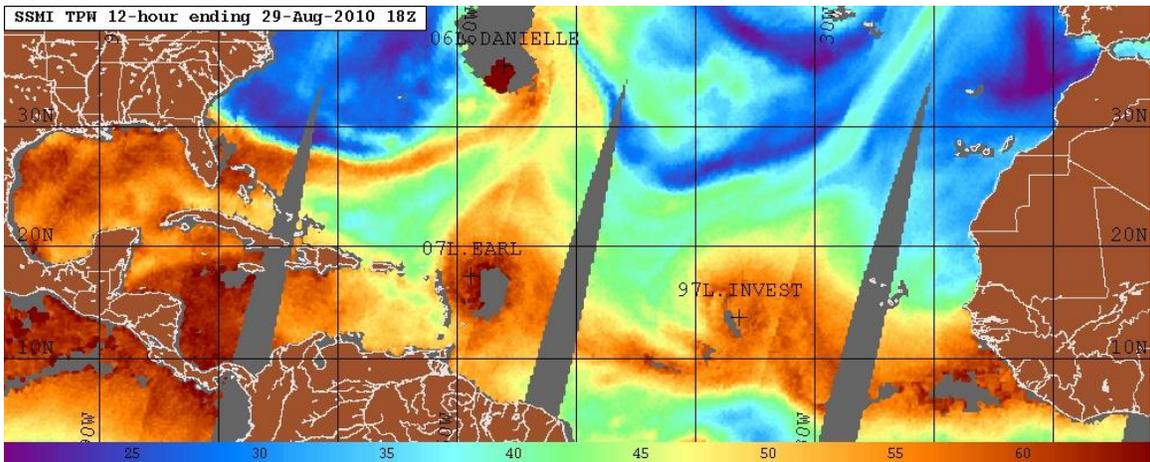
S2



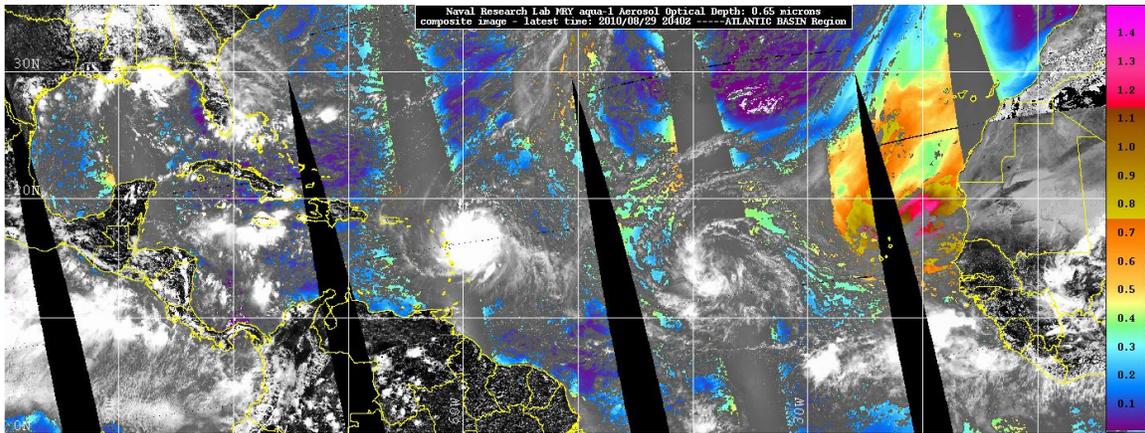
S3



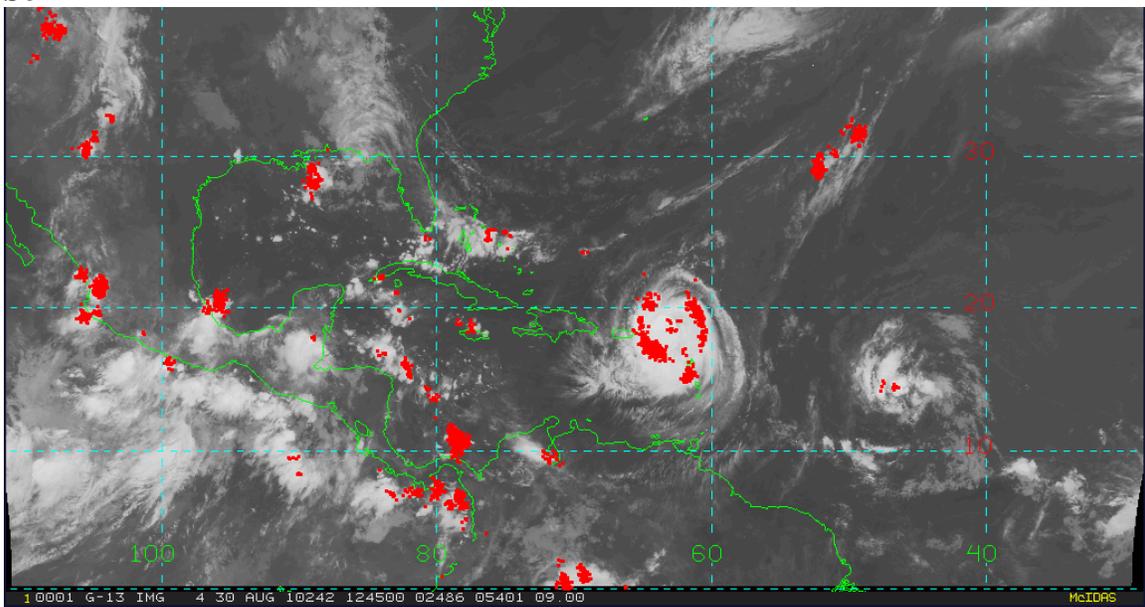
S4



S5

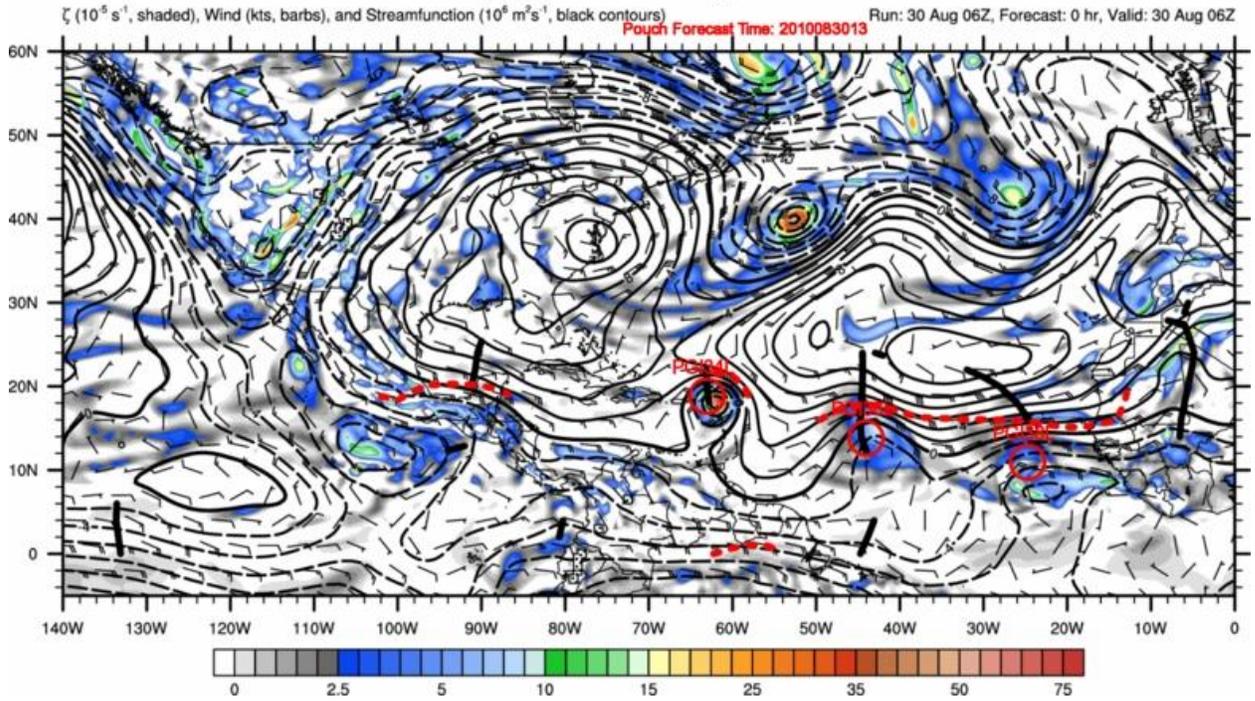


S6



S7

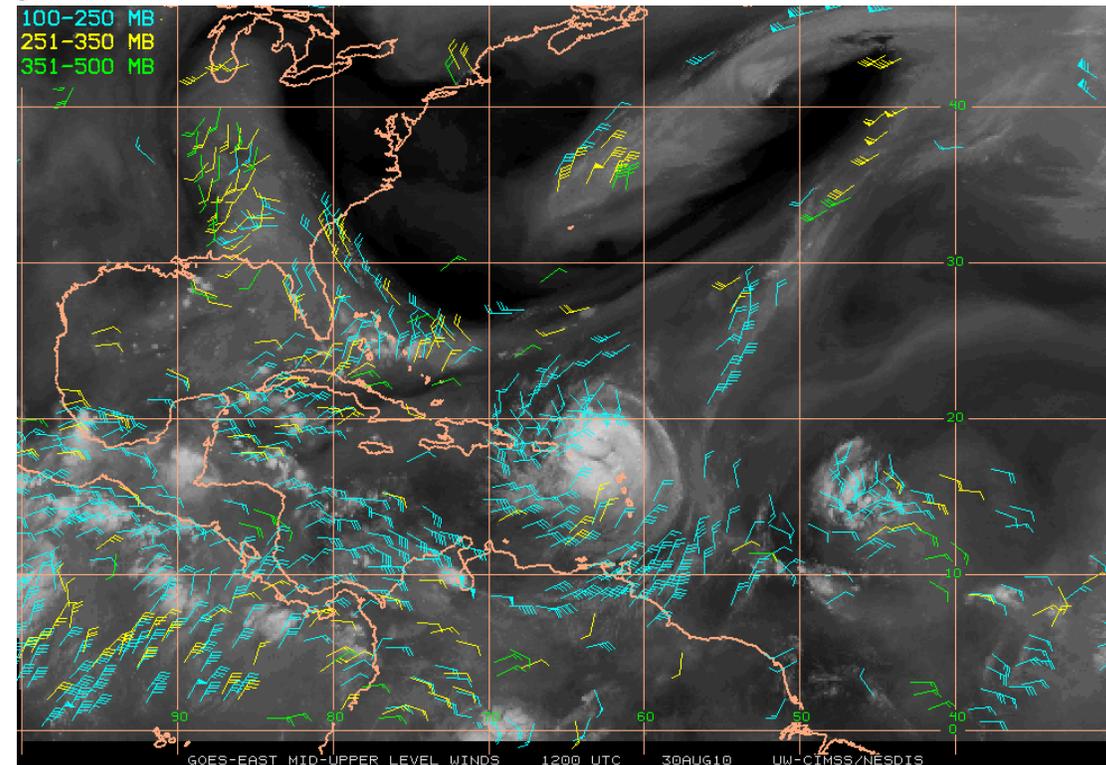
### 700 hPa Wind, Relative Vorticity, and Streamfunction



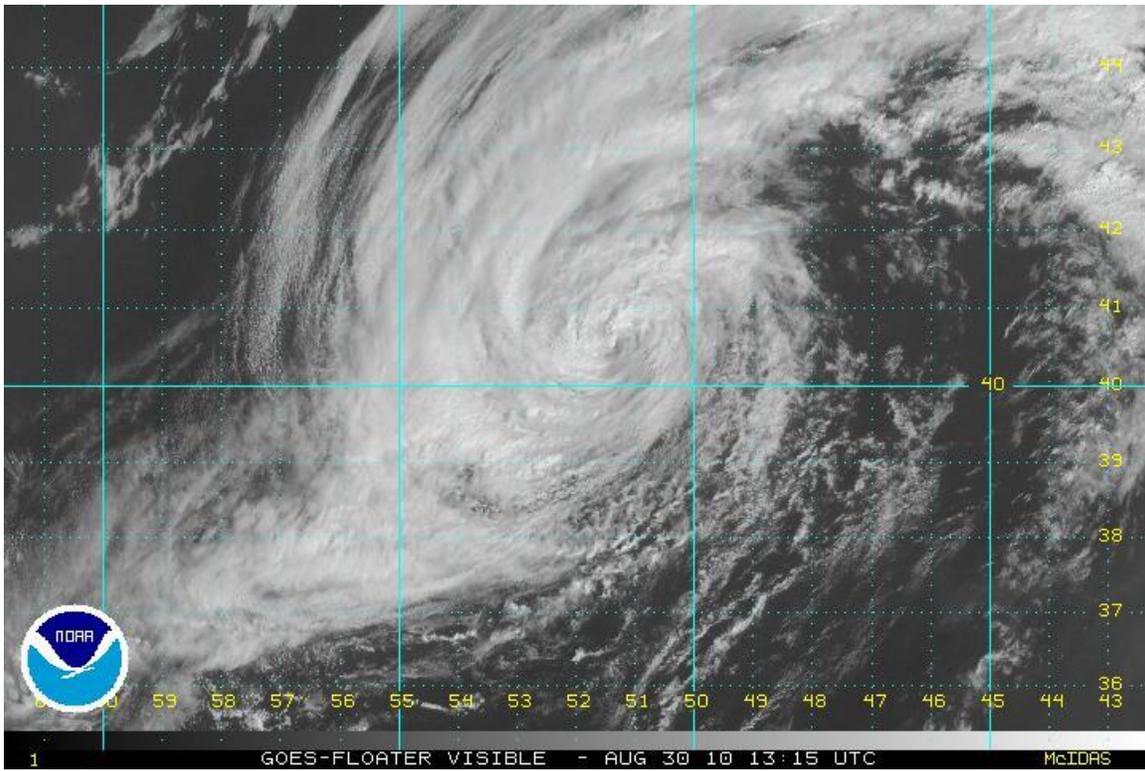
### CIMSS Analyses:

#### Upper levels:

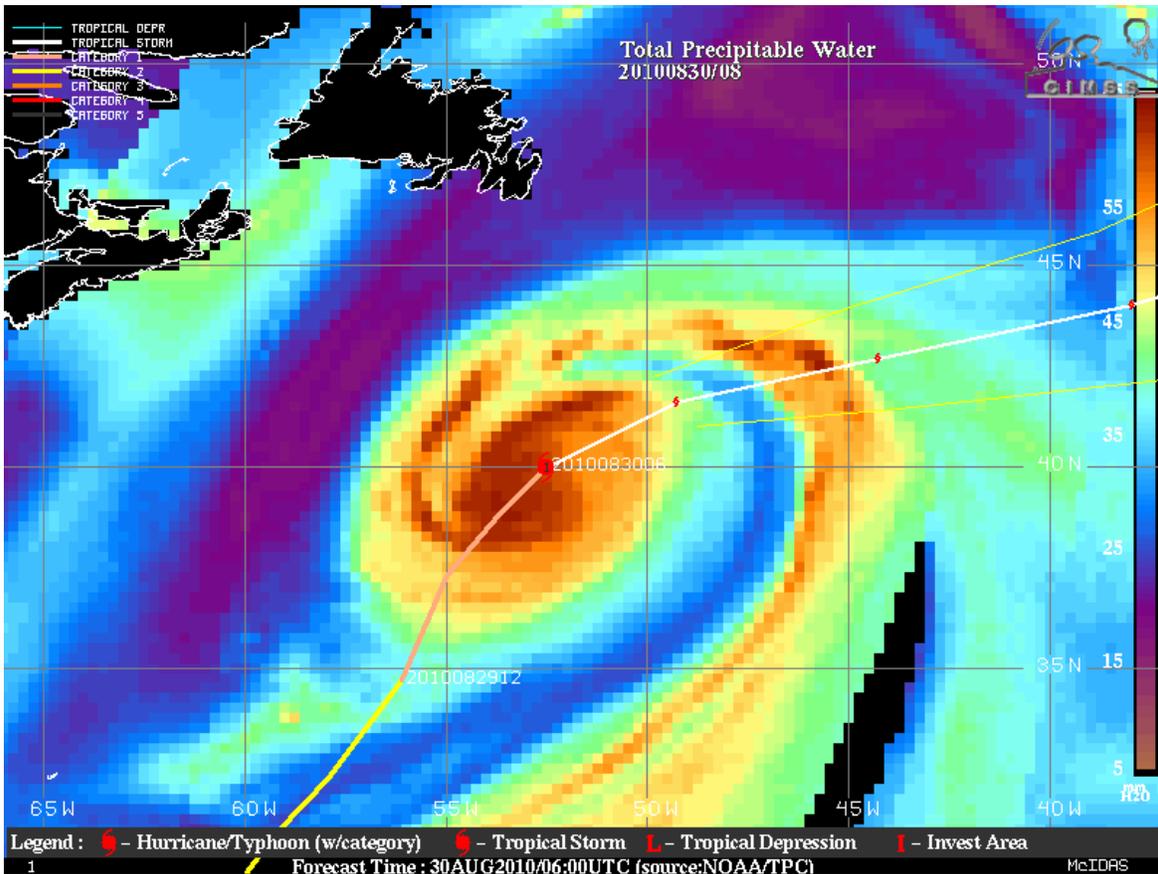
C1



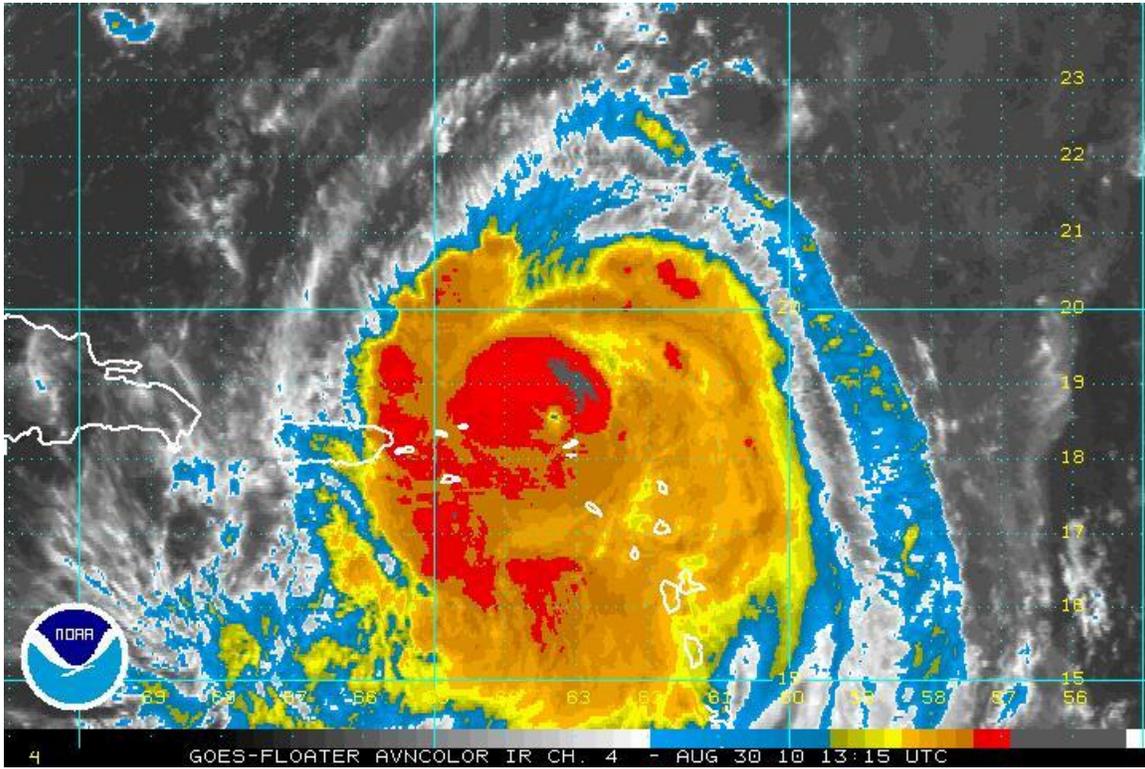
**D1 Danielle:**



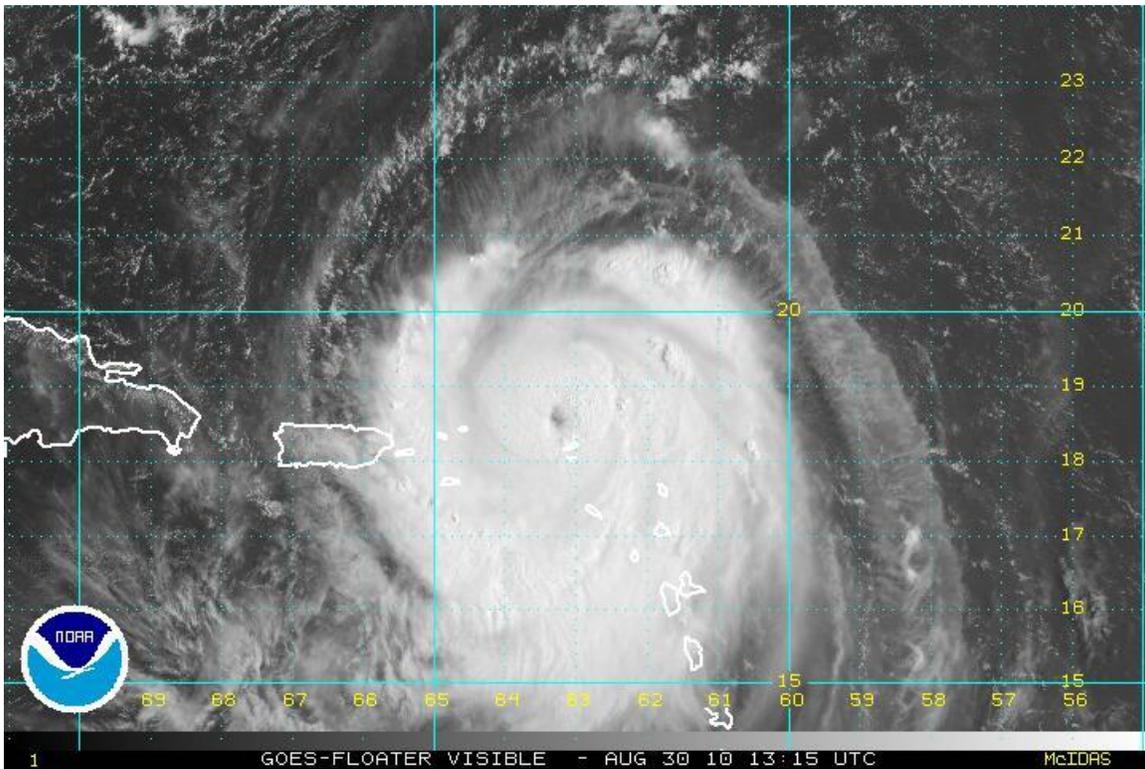
**D2**



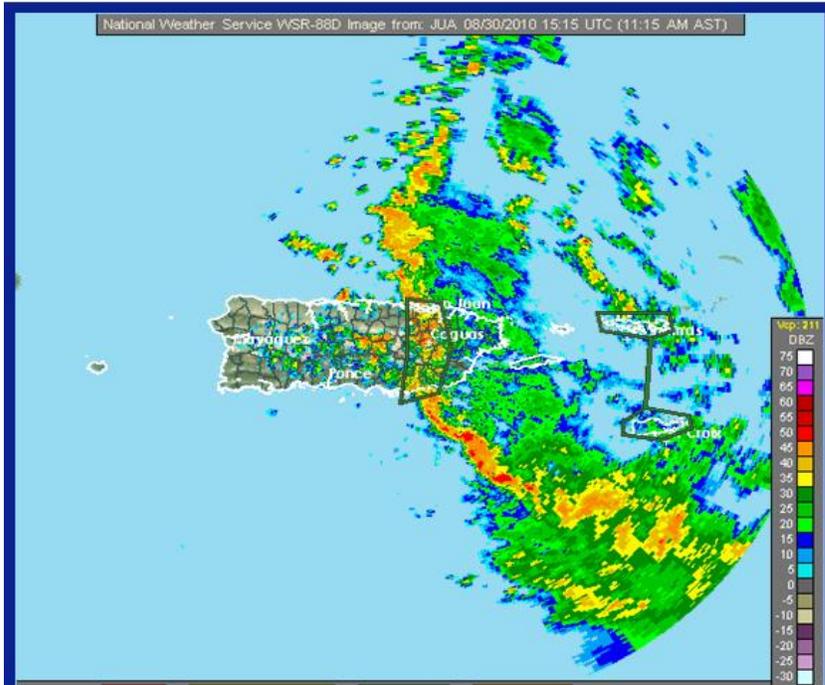
**E1 Earl:**



**E2**

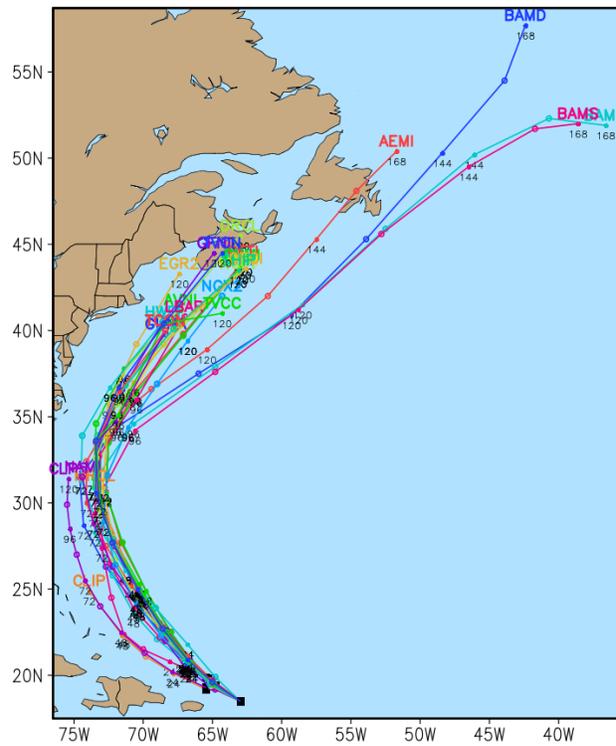


E3



E4

Atlantic HURRICANE EARL Model Tracks  
Valid Time: 1200 UTC 30 August 2010



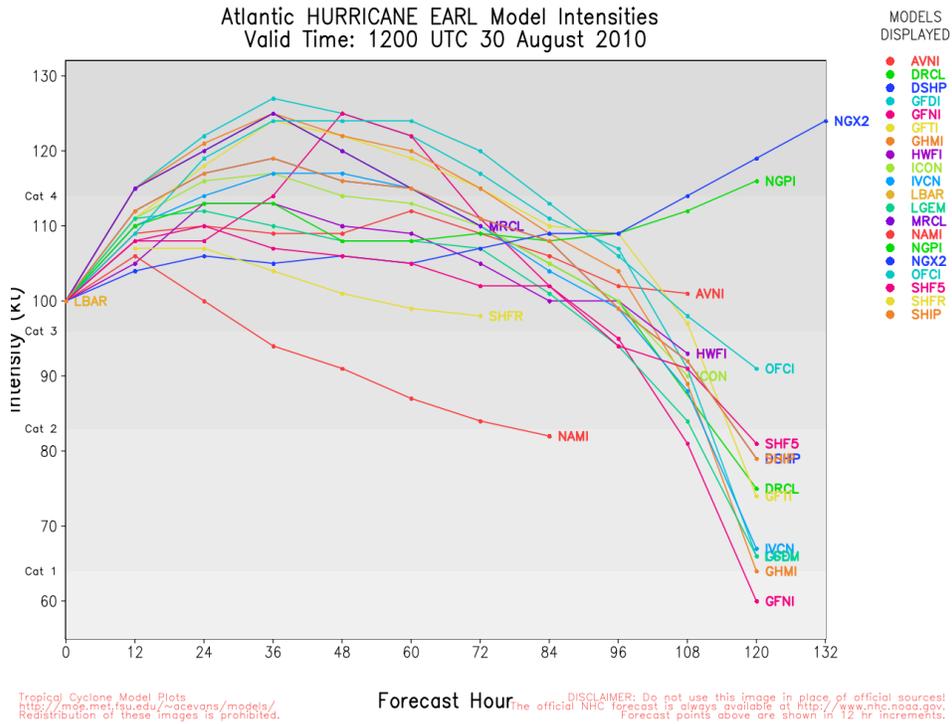
MODELS  
DISPLAYED

- AEMI
- AVNI
- BAMD
- BAMB
- BAMS
- CGUN
- CLIP
- CLP5
- DRCL
- DSHP
- EGR2
- GFDI
- GFNI
- GFTI
- GHMI
- GUNA
- HWF1
- LBAR
- LGEM
- MRCL
- NAMI
- NGP1
- NGX2
- OFCI
- SHIP
- TCCN
- TCON
- TVCC
- TVCN

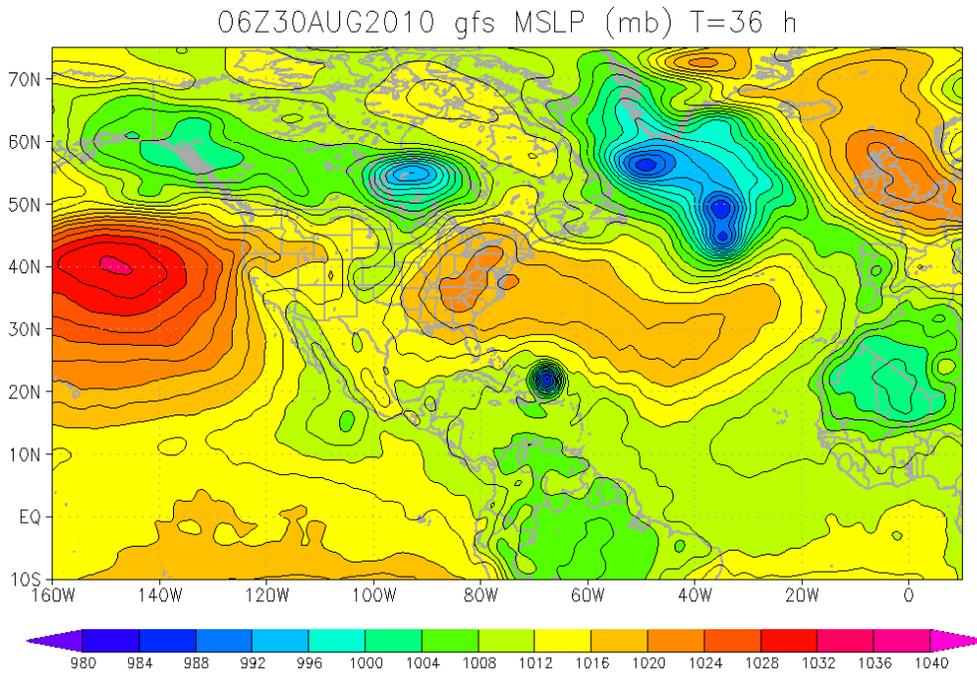
Tropical Cyclone Model Plots  
<http://moe.met.fsu.edu/~acevans/models/>  
Redistribution of these images is prohibited.

DISCLAIMER: Do not use this image in place of official sources!  
The official NHC forecast is always available at <http://www.nhc.noaa.gov/>.  
Forecast points above are shown in 12 hr increments. Initial points denoted by black squares.

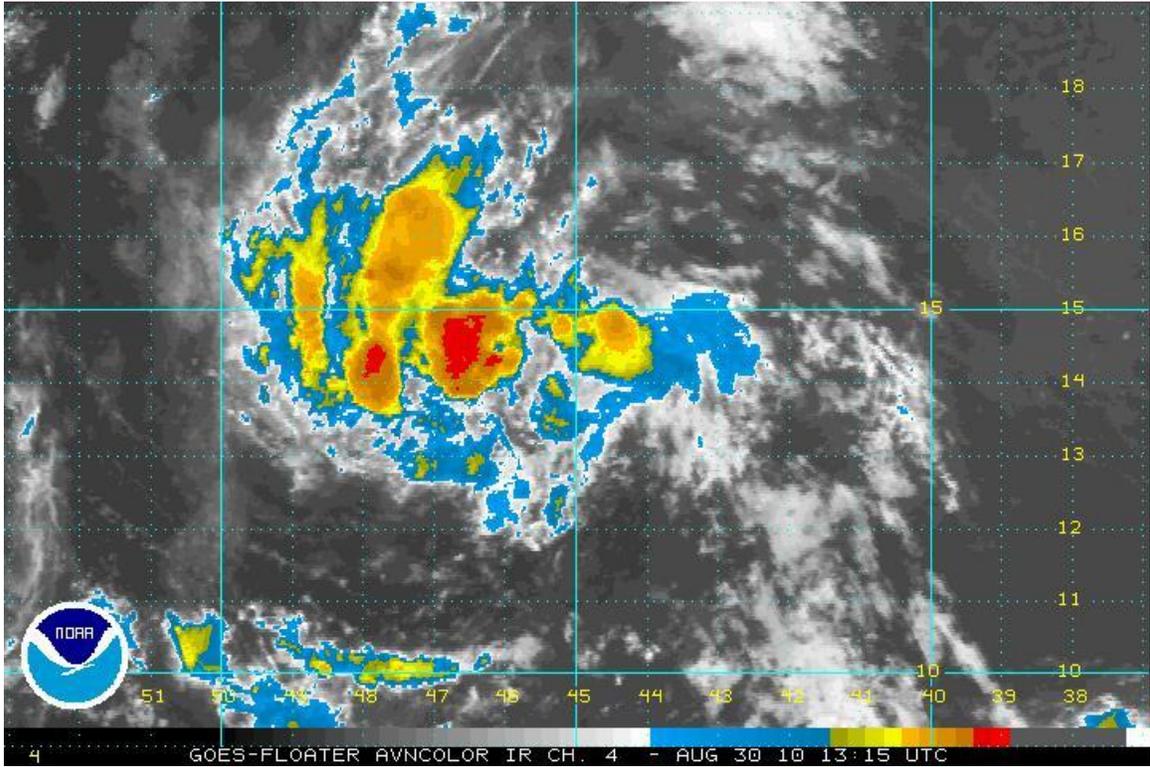
E5



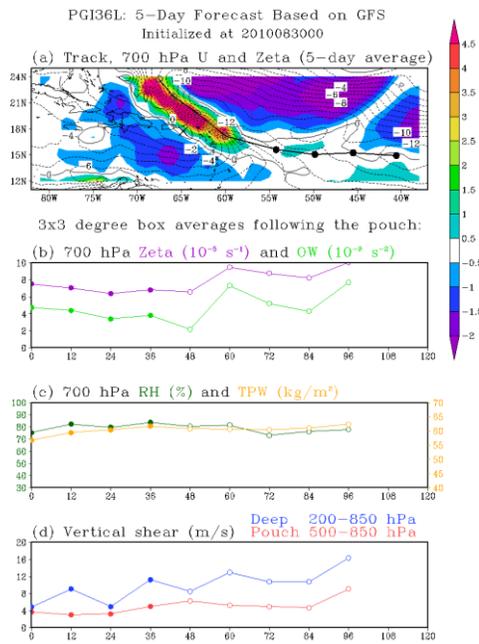
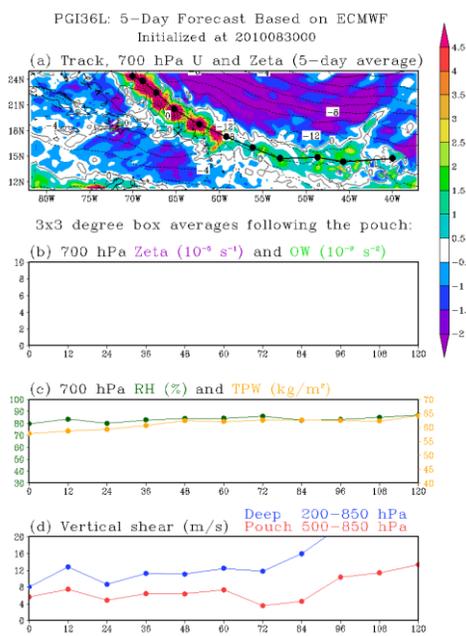
**GFS at 36 hours from 0600 UTC Aug 30 initialization:**



**AL97/PGI-36L/Soon-Fiona:  
F1**



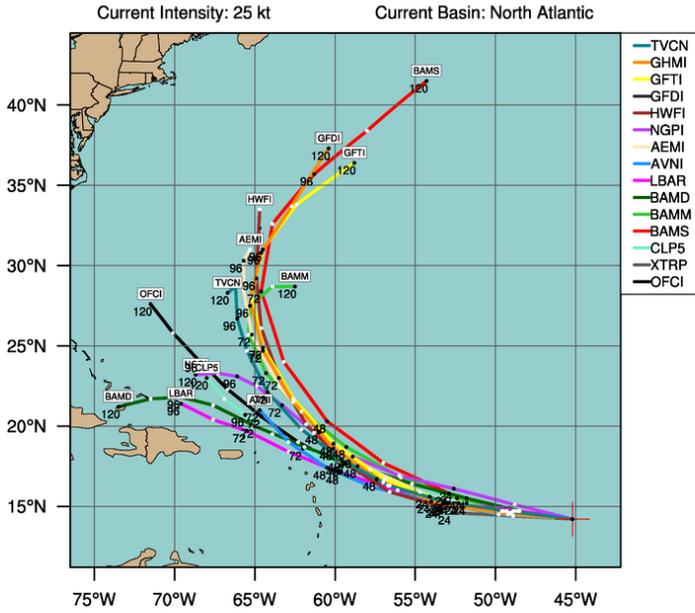
**F2**



F3

## LOW INVEST (AL97)

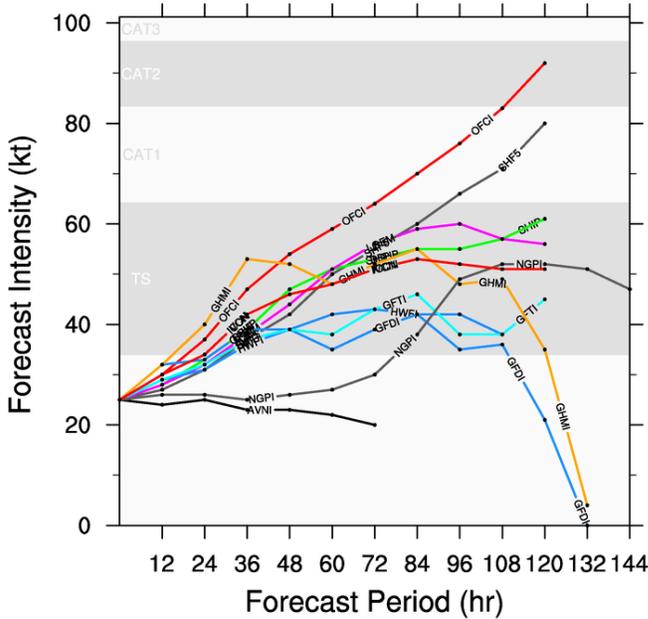
Early-cycle track guidance valid 1200 UTC, 30 August 2010



This plot does not display official storm information. Use for information purposes only.  
DO NOT USE FOR LIFE AND DEATH DECISIONS!

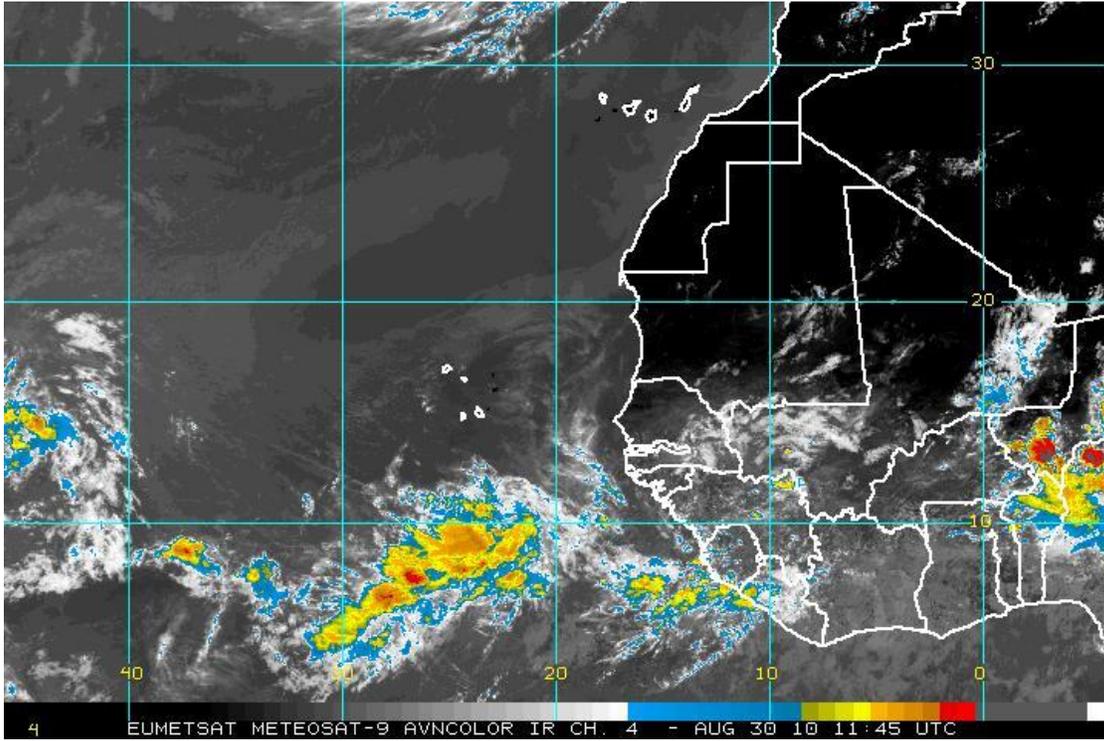
F4

## LOW INVEST (AL97) Early-cycle intensity guidance valid 1200 UTC, 30 August 2010

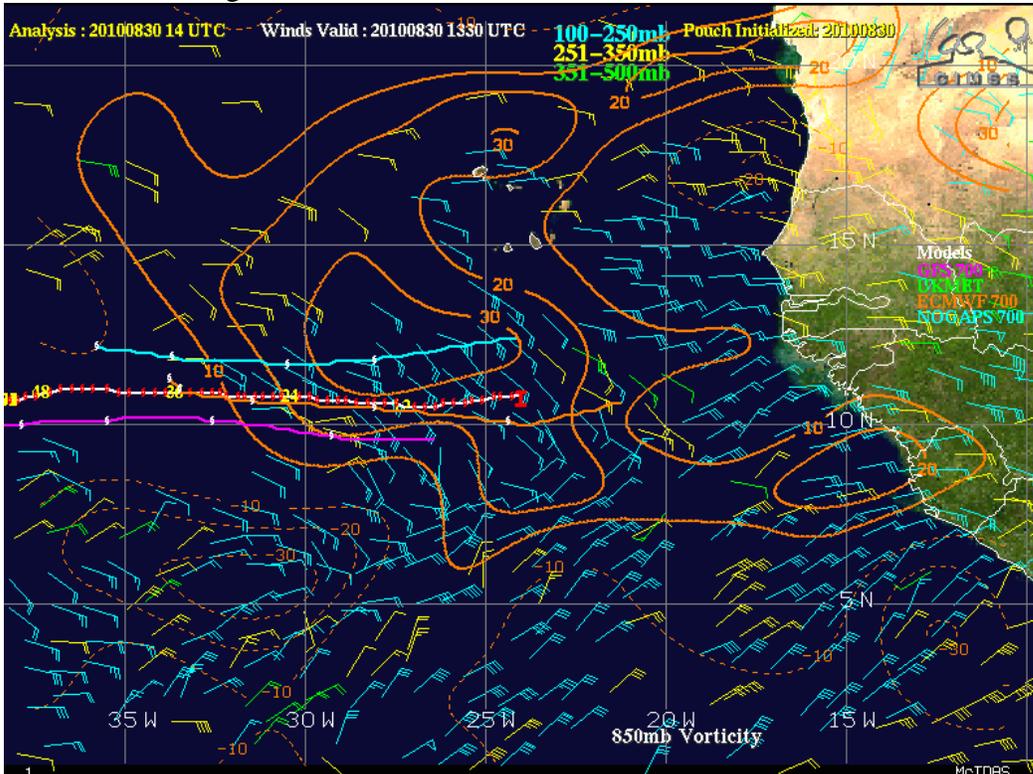


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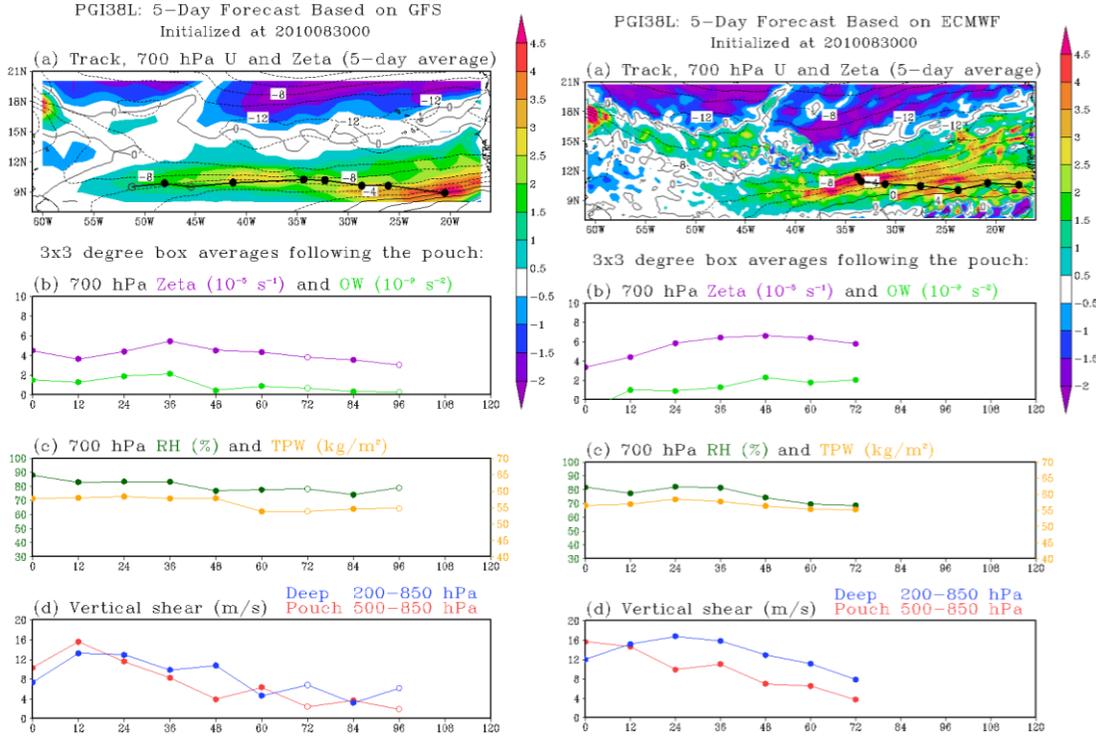
PGI-38L:  
38A



38B The forecast tracks from global models, 850-hPa vorticity and upper level wind at 1400 UTC 30 August.



**38C Pouch analysis valid at 0000 UTC 30 August from (left) the GFS and (right) the ECMWF.**



**38D SAL/Aerosols:**

